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DOCKET NO: 205040US0



IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF

NORIKO SUEHIRO, ET AL.

EXAMINER: RUDE, T.

SERIAL NO: 09/813,988

FILED: MARCH 22, 2001

GROUP ART UNIT: 2871

**FOR: LIQUID CRYSTAL DISPLAY
ELEMENT AND LIQUID CRYSTAL
DISPLAY APPARATUS**

DECLARATION UNDER 37 C.F.R. § 1.132

**COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313**

SIR:

Now comes Dr. Noriko Suehiro who deposes and states:

1. That I am a graduate of The University of Tokyo, Department of Applied Physics, and received a Ph.D. degree in the year 1997.
2. That I have been employed by Asahi Glass Corporation for 6 years as a researcher in the field of research and development of Liquid Crystal Displays (LCDs).
3. That I understand the English language or, at least, that the contents of the Declaration were made clear to me prior to executing the same.
4. That the following experiment was carried out by me or under my direct supervision and control.

Experiment

A liquid crystal (LC) cell according to the present invention was prepared as in Examples 1 and 2 of the present invention.

The resulting LC cell had a cell gap of $d=4\mu\text{m}$, a pixel pitch of $240\mu\text{m}$, an interline space of $a=10\mu\text{m}$, a ratio a/d of 2.5, and 360×240 electrode lines.

An external force was applied to the surface of the LC cell. The attached photographs which are incorporated into this Declaration depict the following:

Photograph 1. In the initial condition, the liquid crystal layer is in the focal conic state.

Photograph 2. After touching the surface of the cell with an applicator, the portion of the LC layer that was influenced by the external force transitions into the planar state and becomes green.

Photograph 3. The focal conic state has been restored (black display) by first making the liquid crystal layer homeotropic using a high-voltage pulse (30 V), and restoring the liquid crystal layer to the focal conic state by a middle-level pulse voltage (16 V). The area previously influenced by the external force has been restored.

Detailed explanation of photograph 2. In picture 2, a doughnut-like (or a ring) zone exists having a green color. The center portion is darker than the neighboring region. The doughnut-like portion is green because the liquid crystal layer has transitioned into the planar state from the focal conic state as a result of applying an external force with an applicator.

The doughnut-like portion has the appearance of a grid due to the following: The grid is proportional to the actual pixel size. The sample device has a constitution of $230\mu\text{m}$ electrode width and $10\mu\text{m}$ interline-portion size. The darker color which is a greenish-black color corresponds to the focal conic state of the LC layer and is almost transparent. In addition, the black-color of backside is visible from the front side. In the pixel portion of the electrode, the focal conic state is almost kept, but in the interline-portion between the

adjacent line-electrodes the phase of LC changes to the planar state which makes the light to be bright green color (selective-reflective wavelength-visible color).

5. The undersigned petitioner declares further that all statements made herein of her own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

6. Further deponent saith not.

Noriko Suehiro
Signature

Jan. 23, 2004
Date

“Before” and “After” when an external force is applied to the surface of Ch-LCD

<Experiment: gap $d=4\mu m$, pixel pitch=240 μm , interlayer space $a=10\mu m$, a parameter $a/d=2.5$ >

① Initial condition (FC state)

② After touching the surface by an applicator
→ Influenced portion of LC layer becomes

to be a PL state (Green color).

③ Restore to the FC state (Black display)
Made LC Homeotropic by a high-voltage pulse,
then restore the FC state by a middle-level pulse
voltage. The “Area” is restored.

